

Client Meeting #1 Minutes

Device Parameters, Improvements, Logistics

- The team last year did an excellent job according to the client, he is hoping that this year we are able to improve on the robustness of the device and prototype something that consistently works, is easy to utilize, and does not slip during use.
- The client's expectations for the design this year are to quickly figure out a mechanism for the shaver, design a consistent and reliable controller, develop abrasives for *in vitro* use, and have variable speed RPMs.
- The budget may be used for anything that we deem of importance or necessary to complete the project.
- The client recommended surgical grade steel and titanium for the prototype.
- The client asked that the device retains the pistol grip design, that it has a straight shaft with the shaver attached to the end of it, that the connection where the shaft meets the shaver be adjustable to any angle for comfort, and that the design remains simple so that no parts are able to break off inside of a patient.
- The client mentioned that we can meet as often as we would like, preferably on Friday afternoons.

Background Information

- The client specified that this device will only be used for knee surgeries, and that it should be designed around the anatomical needs of the knee
- Currently, there are arthroscopic shavers on the market that utilize a straight-handle, straight-shaft design, but that none of them have a pistol grip design. We may be able to reference them for ideas. Stryker is one such manufacturer of these tools.
- Historically, arthroscopic tools have failed via parts breaking off inside of the patient. The shaft needs to be well-secured to the exterior portion of the device, and the rotation of the shaver inside of the patient must be completely secured to the shaft itself to prevent breakage during use.

Technical Specifications

- The operating range for the device should be between 900-6000 RPMs. These must be variable if possible, and the trigger should act as a toggle switch to activate and deactivate the device.
- The device should be compatible with 100-400 grit shavers; it was determined last year that ~350 grit was appropriate for bone, but such testing was not able to occur for cartilage. As certain parts of the meniscus are potentially going to be shaved, and the meniscus is vascularized at a certain point, we should ideally develop a "rough" grit for general cartilage and a "smooth" grit for vascular cartilage.
- The client specified that the device battery should last for approximately 2 hours, and that it should be cordless and easy to manipulate.
- The device should be compatible with interchangeable heads, including different shavers. A degree of modularity would be appreciated.

- The device should be compatible with suction applied externally through a vacuum pump. Debris will need to be picked up around the shaver head inside of the patient, and debris size will be small enough that we should not need to design large tolerances of space around the shaver head.
- The device itself should be reusable, with replaceable shaver heads. For sterilization, the device will need to be able to be disassembled and autoclaved at up to 60kPa and 150°C.
- The strictest design tolerance for the device will be the main shaver shaft, which should not exceed 4mm in diameter. Smaller is better, and 3mm would be appropriate for a wide variety of arthroscopic shaving surgeries.
- The device will have to operate in a cavity that is filled with saline. It will need to be waterproof and corrosive-resistant.

Testing & Production

- We do not need to worry about pushing the prototype of this device to *in vitro* testing in the human population. The device will likely be tested on chicken bones and cartilage to determine its uses and work out any difficulties.
- In designing a robust device prototype, we should try to exclusively utilize surgically/medically approved materials where possible. This will allow for the streamlining of certification in the future if the device is ever pushed to market. Products created with medically approved materials are more easily certified for human use than those that are not.